

## WHAT IS CLAIMED IS:

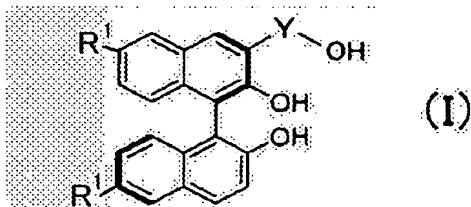
1. An asymmetric reaction catalyst obtained by mixing a pentavalent niobium compound and a triol or tetraol having an optically active binaphthol structure of R or S configuration.

2. An asymmetric reaction catalyst according to claim 1, wherein the niobium compound is represented by the following formula:



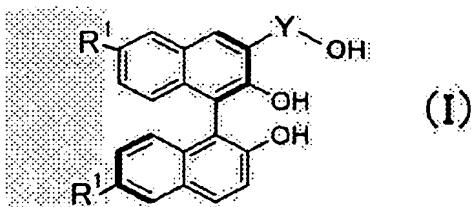
(wherein, X is an alkoxide or a halogen atom).

3. An asymmetric reaction catalyst according to claim 1, wherein the triol is represented by the following formula (I):



(wherein, Y represents a divalent hydrocarbon group and R¹ represents a hydrogen atom, a halogen atom, a perfluoroalkyl group having at most four carbons, or an alkyl group or alkoxy group having at most 4 carbons).

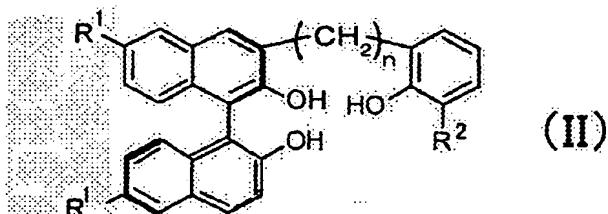
5 4. An asymmetric reaction catalyst according to claim 2, wherein the triol is represented by the following formula (I):



(wherein, Y represents a divalent hydrocarbon group and R¹ represents a hydrogen atom, a halogen atom, a perfluoroalkyl group having at most four carbons, or an alkyl group or

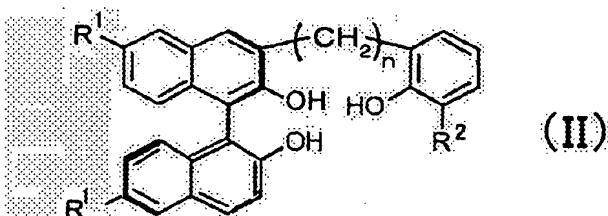
alkoxy group having at most 4 carbons).

5. An asymmetric reaction catalyst according to claim 1, wherein the triol is represented by the following formula (II):



(wherein, R<sup>1</sup> represents a hydrogen atom, a halogen atom, a perfluoroalkyl group having at most 4 carbons, or an alkyl group or an alkoxy group having at most four carbons; R<sup>2</sup> represents a hydrogen atom or a hydrocarbon group having 1 to 10 carbons; and n is an integer from 0 to 2).

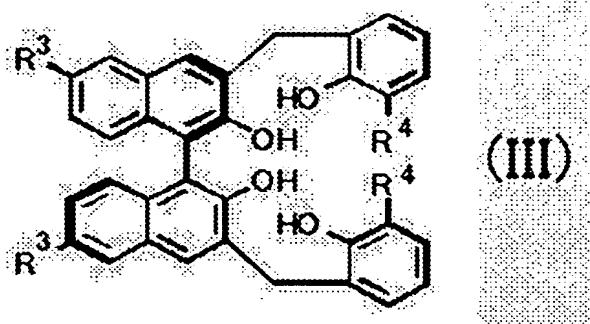
6. An asymmetric reaction catalyst according to claim 2, wherein the triol is represented by the following formula (II):



(wherein, R<sup>1</sup> represents a hydrogen atom, a halogen atom, a perfluoroalkyl group having at most 4 carbons, or an alkyl group or an alkoxy group having at most four carbons; R<sup>2</sup> represents a hydrogen atom or a hydrocarbon group having 1 to 10 carbons; and n is an integer from 0 to 2).

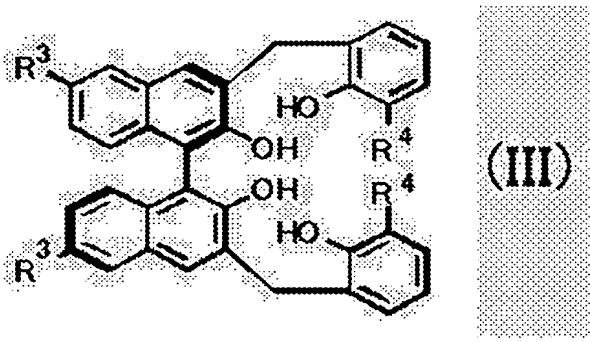
7. An asymmetric reaction catalyst according to claim 1, wherein the tetraol is represented by the following formula

5 (III):



(wherein,  $R^3$  represents a hydrogen atom, a halogen atom, a perfluoroalkyl group having at most 4 carbons, or an alkyl group or alkoxy group having at most 4 carbons and  $R^4$  represents a hydrogen atom or a hydrocarbon group having 1 to 10 carbons).

8. An asymmetric reaction catalyst according to claim 2, wherein the tetraol is represented by the following formula (III):



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(wherein,  $R^3$  represents a hydrogen atom, a halogen atom, a perfluoroalkyl group having at most 4 carbons, or an alkyl group or alkoxy group having at most 4 carbons and  $R^4$  represents a hydrogen atom or a hydrocarbon group having 1 to 10 carbons).

9. A method for preparing an optically active compound, wherein a reaction substrate represented by  $R^5R^6C=N-Z$  (wherein  $R^5$  and  $R^6$ , not being the same, are selected from the group consisting of a hydrogen atom, a hydrocarbon group, an alkoxy carbonyl group, and a hydrocarbon group having a

functional group and Z represents an aryl group or an acylamino group) and a nucleophilic agent are reacted by nucleophilic addition using an asymmetric reaction catalyst according to claim 1.

10. A method for preparing an optically active compound, wherein a reaction substrate represented by  $R^5R^6C=N-Z$  (wherein  $R^5$  and  $R^6$ , not being the same, are selected from the group consisting of a hydrogen atom, a hydrocarbon group, an alkoxy carbonyl group, and a hydrocarbon group having a functional group and Z represents an aryl group or an acylamino group) and a nucleophilic agent are reacted by nucleophilic addition using an asymmetric reaction catalyst according to claim 2.

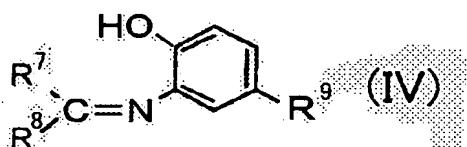
11. A method for preparing an optically active compound, wherein a reaction substrate represented by  $R^5R^6C=N-Z$  (wherein  $R^5$  and  $R^6$ , not being the same, are selected from the group consisting of a hydrogen atom, a hydrocarbon group, an alkoxy carbonyl group, and a hydrocarbon group having a functional group and Z represents an aryl group or an acylamino group) and a nucleophilic agent are reacted by nucleophilic addition using an asymmetric reaction catalyst according to claim 3.

12. A method for preparing an optically active compound, wherein a reaction substrate represented by  $R^5R^6C=N-Z$  (wherein  $R^5$  and  $R^6$ , not being the same, are selected from the group consisting of a hydrogen atom, a hydrocarbon group, an alkoxy carbonyl group, and a hydrocarbon group having a functional group and Z represents an aryl group or an acylamino group) and a nucleophilic agent are reacted by nucleophilic addition using an asymmetric reaction catalyst according to claim 4.

13. A method for preparing an optically active compound,

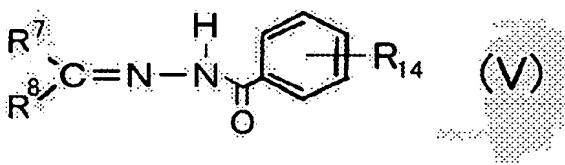
wherein a reaction substrate represented by  $R^5R^6C=N-Z$  (wherein  $R^5$  and  $R^6$ , not being the same, are selected from the group consisting of a hydrogen atom, a hydrocarbon group, an alkoxy carbonyl group, and a hydrocarbon group having a functional group and  $Z$  represents an aryl group or an acylamino group) and a nucleophilic agent are reacted by nucleophilic addition using an asymmetric reaction catalyst according to claim 5.

14. A method for preparing an optically active compound according to claim 9, wherein the above-mentioned reaction substrate is an imine represented by the following formula (IV):



(wherein,  $R^7$  and  $R^8$ , not being the same, are selected from the group consisting of a hydrogen atom, a hydrocarbon group, and a hydrocarbon group having a functional group and  $R^9$  represents a hydrogen atom or a trifluoromethyl group).

15. A method for preparing an optically active compound according to claim 9, wherein the above-mentioned reaction substrate is a benzoylhydrazone represented by the following formula (V):

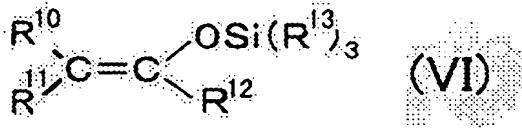


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(wherein,  $R^7$  and  $R^8$ , not being the same, are selected from the group consisting of a hydrogen atom, a hydrocarbon group, and a hydrocarbon group having a functional group and  $R^{14}$  represents a hydrogen atom or a substituent having an

electron-withdrawing property).

16. A method for preparing an optically active compound according to claim 9, wherein the above-mentioned nucleophilic agent is a silicon enolate represented by the  
5 following formula (VI):



(wherein R<sup>10</sup> and R<sup>11</sup> are each independently one selected from the group consisting of a hydrogen atom, an aliphatic hydrocarbon group, an aromatic hydrocarbon group, an alkyloxy group, an aryloxy group, and an silyloxy group; R<sup>12</sup> is one selected from the group consisting of a hydrogen atom, an aliphatic hydrocarbon group, an alkyloxy group, an aryloxy group, an arylthio group, and a alkylthio group; and each R<sup>13</sup>, being the same or different, represents a hydrocarbon group).

17. A method for preparing an optically active compound according to claim 9, wherein an imidazole derivative is added to the reaction system.

18. A method for preparing an optically active compound according to claim 9, wherein a synthetic crystalline zeolite is added to the reaction system.

19. A method for preparing a optically active compound, wherein a reaction substrate and a nucleophilic agent are reacted by nucleophilic addition using an asymmetric reaction catalyst according to claim 1.

20. A method for preparing an optically active compound according to claim 19, wherein the reaction substrate is an epoxide, the nucleophilic agent is a nitrogen compound, and the optically active compound is a nitrogen-containing compound.